Engineering Innovations

the CANNON

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Fees to Increase
Dean Looks to Future

by Gordon R. Slemon
Dean of Engineering

The operating hudget of the Faculty of Applied Science and Engineering is $1,300,000 short of what it needs this year to meet the modest quality criteria on supplies, equipment and teaching assistants adopted in principle at a recent meeting of Faculty Council. Since these three expenditures are almost entirely for undergraduate education, they alone represent a shortage of almost $500 per undergraduate student. There are in addition, significant shortfalls in the numher of academic support staff.

In June 1980, the Canadian Accreditation Board expressed grave concern over the funding deficiencies of our Faculty—deficiencies which have become more serious in the last 18 months—and required that we report hy September 1982 on improvements made.

The foremost concern of all of us in the Faculty must he to restore and improve the quality of engineering education. On behalf of the Faculty, I will he making strong representations to the University hudget authorities to ohtain an increased hut fair share of the University's resources. There is however little expectation this year that this source will be ahle to provide for a significant improvement in the Faculty's hudget. There may well he another in the long series of budget cuts which have led to the current crisis.

The time has come for all of us in the Faculty to assert our determination to correct this situation, reverse the trend toward lowered quality and assure the future of this Faculty as a world-class engineering institution. Steps are heing taken to solicit increased financial support from alumni and from industry. The staff of the Faculty, already overworked, is initiating new income-producing ventures in continuing education, contract research, and services to industry.

I am calling on undergraduate engineering students to make their contrihution to maintenance of quality by agreeing to a $100 annual incidental fee for this purpose. Income from this fee would he used entirely to pay for additional supplies, equipment and assistants in undergraduate lectures, lahoratories and tutorials. Charges now made from time to time for lecture notes etc. would he discontinued and the cost would be met from this fund.

I make this proposal from a conviction that students in engineering, while often boisterous in their leisure time, are very serious ahout their education. I am confident that they value quality sufficiently to make this contrihution from their admittedly limited financial resources. Over four years, the total incidental fee would he equal approximately one week's income after graduation. In 1982-83 and succeeding years, it would provide an additional $260,000 annual fund for needed supplies, equipment and teaching assistants—a contrihution equal to 20% of the current estimated deficit in these resources.

In making this proposal I

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A man whn needs nn introductinn: Gordon R. Slemnn, Dean nf the Faculty of Applied Science and Engineering at the University of Toronto.

APEO in Conference

hy Bill Mark
Elec Eng 8T2

The site for this year's annual APEO-UES (Association of Professional Engineers of Ontario-Undergraduate Engineering Societies) conference, held last month, was Hamilton's McMaster University. The conference itself seeks to bring delegates from engineering schools throughout the province together with representatives from the profession to examine a predetermined topic. This year's speakers from both industry and government addressed the topic of research and development (R & D) in Canada. During the three days of the annual gathering the aspects of R & D covered ranged from how it affects NSERC grants to industrial strategy with regards to R & D and in general proved to he an enlightening experience.

One of the first speakers, a representative of the government presented a general overview of the state of R & D in the nation. Delegates were told that of all industrialized nations in the world, Canada has the worst record for percentage of Gross National Product (GNP) spent on R & D. To help remedy this, the government has made a commitment to *raise* the level of R & D spending to a mere 2% for a target date later this decade. The hulk of the spending increases is to be in the industrial sector. From current statistics it can he shown that for the size of the Canadian economy, spending hy government and universities is of the correct proportion while investment from industry is sadly lacking. Much time

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This Month

Fee Increase
Above is the Dean's proposal for an incidental fee increase for undergraduate students. He is seeking student opinion to his suggested policy at the Eng Soc meeting tonight. One student speaks out..... page 2

OEDC Deadline Extended
The Ontario Engineering Design Competition has extended is deadline to Friday, Decemher 4. The Entrepreneurial category is virtually full, hut entrants are needed for the Corporate Design and Communications categories..... page 6,7

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the CANNON

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THE CANNON encourages submissions; please type or write legibly. Deadline for articles is one week before publication date, nntices and letters by 5:oo p.m. the Friday prinr in publication. Comments on THE CANNON or articles appearing in it are appreciated. The editors reserve the right to edit letters for brevity.

Letters

To the editor:

I feel compelled to write this letter expressing my appreciation to the people responsible for producing the *Glob and Male* Toike of November 26.

By now, I'm sure most members of the Society realize we have been doing ourselves, and the University, a disservice in printing papers such as the Toikes of the last few years. Last week's edition, however, illustrated beyond a doubt that the potential exists for a truly hilarious yet socially acceptable *Toike Oike*.

As one who has been involved in the Toike controversy for some time, I am very pleased to see the paper moving in the direction that many of us boped it would and knew it could, while we were embroiled in last year's discussions with the Status of Women Committee, the University administration, and others.

I know the names of only two of the people involved with *the Glob and Male*. I thank Steve Roberts and John Samochin, and those who worked witb them, for their considerable time and effort. The issue was not a step, but a quantum leap in the direction the *Toike* must go. I can only bope that the obvious success of their endeavour will motivate enougb people to help with the project, so that the true potential of the *Toike Oike* can be realized.

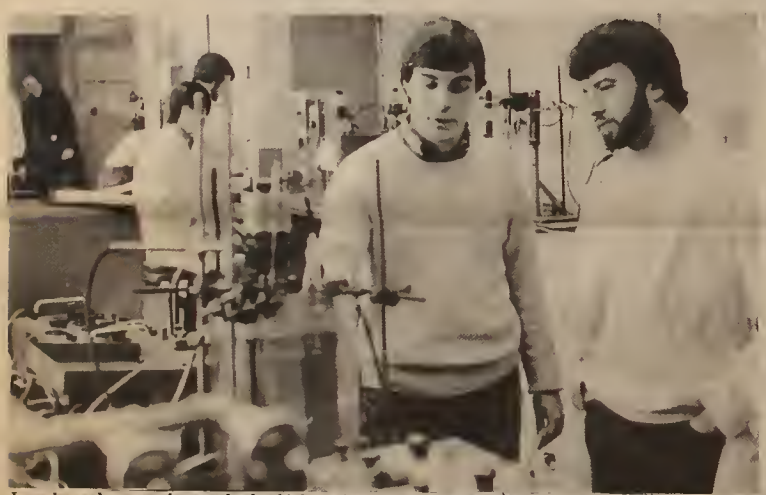
John Voss
Vice President:
Administration

Fee Increase

continued from page 1

have been encouraged by discussions with individual members of the Engineering Society. I will be meeting with Engineering Society Council to explore how the student support can best be assessed and expressed. Since this proposal is for an incidental fee, it is not constrained by the policy of the Ministry of Colleges and Universities on regular tuition fee increases. It will require approval of the Academic Affairs Committee and Governing Council.

Approval of this proposed incidental fee would assert to the University, to government and to the community at large the deep concern felt for the state of engineering education and the willingness of engineering students to do all in their power to ensure the health of the Faculty.



In order to keep up the standards of lab equipment, general supplies and a better tutor to class size ratio, the Dean is suggesting a $100 per undergraduate student fee increase.

Attend CCES?

In January, the annual Congress of Canadian Engineering Students (CCES) conference will be held at the University of Waterloo. These conferences are a great deal of fun and those students who go exchange ideas and attend seminars to come out better informed about both the academic and professional side of engineering. Whereas the Regional Engineering Student Societies Association (RESSA) conference deals in discussing each school's Engineering Society, CCES is aimed more at the student as an engineer-in-training and discusses issues more pertinent directly toward the profession. As a result, CCES often attracts a large number of interested students.

Unfortunately, the University of Waterloo bas somebow decided that the Engineering Societies across Canada are inappropriately wealthy and have set the delegate's fees at $115 and observers fees at $130 (observers are representatives of a school who are ineligible to vote on the resolutions made in council at the meetings). This is a probibitively bigh cost, especially for observers who have fewer rights than delegates. Tbe RESSA conference set delegates fees at $30. In past years, CCES fees bave ranged from $30 to $80 depending on the location of the meeting, and four delegates have usually been sent from eacb school. This year, however, the University of Toronto Engineering Society is only able to send two delegates due to budget allotments.

The Engineering Society is thus faced with a ridiculously bigh cost for registration fees, a limited budget and a desire to send four of five keenly interested students. One suggestion which came up was to use the alloted budget to subsidize the interested students having them pay the remainder of the costs. Before this idea was broached to the interested people themselves, tbe Professional Development Committee refected tbe proposal on the grounds tbat subsidized students are not "officially" representatives of the Eng. Soc. at a conference unless tbe Eng. Soc. pays for 100% of the registration expense as well as travel expenses.

Following the well known argument of *reductio ad absurdum*, consider: if the Eng. Soc. paid tbe registration fee, but not transportation, would the students be delegates? Why yes, of course. Now, if the students had to pay one dollar each to go while the Eng. Soc. paid the other $114, would they be delegates? In practice, no one can deny that they would be. Then, if students paid $10 out of their pockets and had the rest covered by the Eng. Soc., they would still be "official" delegates because the Eng. Soc. is making a significant contribution to their conference expenses. Thus, there is no *real* difference between a delegate who is subsidized 100% or say 80%. The only difference may be tbat because he is spending his own money, the student may be more attentive and strive to get more out of the conference. The argument over the proposal still continues on semantic grounds as to whether or not "subsidized" students are delegates, but it is a moot point.

Tbe situation with tbe 1982 CCES is one which *should* not bave been an issue. Waterloo is quite clearly "off target" by setting prohibitively high fees. This is a conference, not the Social Affair of the decade. However, given that immutable constraint, the Eng. Soc. should send as many interested student as possible; tbeir interest being guaged by how willing they are to pay some of their own money to attend. The nature of CCES, wbich addresses students as engineers rather than mere representatives of their respective societies, lends itself well to this format of payment division. After all, no one stops delegates at the door and demands to know how their registration fees were generated.

Vice Pres Comments

by John Voss
Chem Eng 8T2

The proposition made by Dean Slemon in his article on page 1 bears an important message for all students of the Faculty. The effects on the Faculty of government underfunding of post secondary education have reached crisis proportions. Action must be taken.

It appears that all the conventional avenues have been tried. The Ontario government stubbornly continues to fund the University at a rate below inflation. Efforts to get students to bear a greater sbare of the costs of tbeir education prove fruitless, as students of some faculties protest tbat they already pay too much, and the government (again) regulates tuition fees below the level required. Meanwhile, tbe federal government plans reductions in the Established Program Financing payments it makes to the provinces, a move which can only add to the seriousness of the situation in years to come. We are in dire straits indeed, with the deterioration of our University and our Faculty not just imminent, but occuring now, before our eyes.

It seems there are two possible paths to follow. We can continue to rant and rave to government, trusting that we can somehow enlighten them, and get them to loosen the purse strings before it is too late. Somehow, this route does not appear too promising. OFS and SAC organized rallies, and University lobbying has accomplished little to date. Or we can pursue the second solution, wbicb is, I tbink, the more pragmatic one. We can realize tbat if there is something we want, we are going to have to pay for it. Engineering students are aware of tbe value of their education. They know that they are the prime beneficiaries of their academic training. They realize, too, that without adequate funding, the quality of their education will be seriously eroded, and that they will suffer most.

I encourage all members of the Society to consider the matter carefully. The action proposed by the Dean is an undesirable precedent, but it may be as necessary, and indeed, an inevitable one. It is undoubtedly one way to help the situation, and to maintain the high standards of the University and this Faculty for a little while longer; is it the only way?

Dean Slemon will be addressing the Full Council meeting of the Engineering Society tonight at 5:00 p.m. in GB 202. All interested students are invited to attend, to hear tbe Dean, and to make their opinions known. Please take advantage of tbe opportunity.

Engineering and Man

hy Ping Lin
Eng Sci 8T5

Since the Industrial Revolution, man has steadily gained ability to manufacture machinery to alter the natural environment he lives in. Along with the numerous technological changes, there came ahout changes that reshaped the form and structure of the whole society. In *Man, Machines and Modern Times*, Elting Morison examines the process of a mechanical change, with special emphasis on its effects on the people who live and work with the mechanical system, and suggests some ways in which the process can he altered to henefit society. This question would he raised only hy those with a lucid understanding of the history of the human world, and answers would hy proposed only hy those concerned with its future. It is admirahle that Morison possesses hoth of these characteristics.

Morison divides the process of a mechanical change, or invention, into four parts: "the condition of things at the point or origin of any mechanical change, the character of the primary agents of change, the nature of the resistance to change, and the means to facilitate general accomodation to the changes introduced." Each of these aspects were illustrated with examples, mostly from the military world with which he is familiar. He uses material that he has the most experience in.

·Although many inventions apear to he purely accidental, Morison points out that this is, in general, not so. "The essential idea for change occured in part only hy chance hut in an environment that contained all the essential elements for change and to a mind prepared to recognize the possihility for change." These minds are the inventors, often people who rehel against authority and tradition to put the essential elements together into successful comhinations. In most cases, they are opposed hy people who seek to protect the existing devices that the invention may replace and to maintain the existing society the way it is. The inventors identify themselves with change, while their opponents identify themselves with the previously estahlished order. Often, the changes are accomodated only through an outside superior force, totally unidentified with any aspect involved in the change. This analysis appears to he acceptahle. It is not mentioned, however, what the external force should properly he. Should it he controlled hy an authoritarian government, a company concerned only with its own interests, or everyone in our society? This inquiry is worth further noting.

Morison suggests that today's tendency to rationalize and quantify elements in a design very often neglects the qualitative elements, such as human affections, feelings, and memories, which have to he taken into account. Man seems to he preoccupied with change for its own sake, without considering at all what his real needs are. This can result in "fitting men into the machinery", that is, producing such a complicated artificial environment that it cannot he controlled. To prevent this, he proposes that:

> Means must he discovered for society to keep charge over its own nature and direction. Three things appear necessary to achieve this end. First, the memhers of a society must feel that they are participating in the way affairs are ordered, that they have the power of choice. Second, to make this sense of participation and choosing real, the memhers of the society must have availahle the kind of evidence required to make judgement among possihle alternatives. Third, they must have, heyond the evidence supplied for any particular case, a sense of a more general point of purpose that would serve as a governing context into which the particular judgements might he fitted.

It is indeed important that human aspects he taken into careful consideration in a design, since any design is for human purposes. However, there are several things that are not clear from Morison's proposal. In a society such as that of North America today, the whole economy and way of life are huilt around commodities. A manufacturer or husinessman may very possibly have interests that conflict with those of a worker or consumer. In that case, who is to make the choice of what machinery and systems to introduce into this society? Who is to supply the evidence for judgement, and what kind of evidence is to he hrought forth? And, last of all, what would be the "more general point of purpose" for this society, if memhers of it have opposing interests and some members dominate over others? It seems to me that the proposal cannot possibly come into effect unless the society is somehow restructured so that everyone has an equal opinion with regard to decisions in the society.

In general, *Man, Machines and Modern Times* is a hook of value to a student in science and engineering, and prohahly even more so to a practicing scientist or engineer. It raises the question: What is it that man really needs, and how is this need related to science, technology and engineering?

Coming Soon

Godiva Week
January 11-15
Chariot Race-Cannon Competition-Movies-Skiing

Conference

continued frnm page 1

was spent on this though why and how the situation arose or the mechanisms that were to he employed to remedy the situation were never presented.

The industrial viewpoint regarding R & D was illustrated hy an industrial researcher from Stelco. The hulk of the material was alone neither new nor greatly enlightening, however the manner in which it was displayed and interrelated formed the hasis of industrial strategy with respect to R & D. Basically the point is this: industry does not do any more research than it has to. Industries are in husiness, husinesses must have profits to survive, therefore any R & D done will ultimately he aimed at the creation of profit. That is to say that industrial research is very goal oriented; at all stages from the initial proposal to the completion of the project you are suhject to review from a profit viewpoint.

Some of the other points of the talk were that industrial R & D is classified as applied research as opposed to pure research which is more typical to universities. In order to justify initiating any R & D program there must he a sufficient market for the products to support such a program and Canada is a very small market. Lastly, it is much easier for the larger multinational companies to import rather than develop technology in Canada.

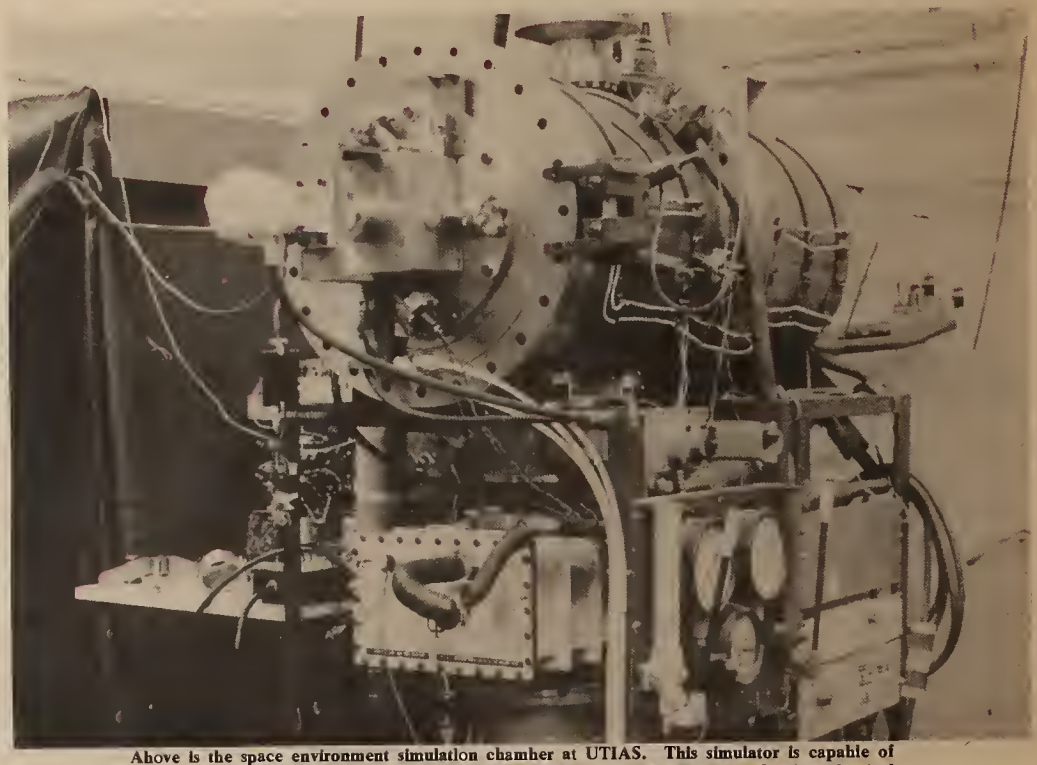
The dinner speaker, another government representative, addressed the congregation on the suhject of NSERC. He hegan hy presenting the results of a study which shows the government will not make its 2% GNP spending goal for R & D. The study shows that a major hottleneck to attaining this goal is a lack of researchers and supporting staff. At this moment there are simply not enough qualified staff trained or trainahle to meet the personnel requirements which accompany the desired increase in R & D. To ease this situation NSERC has changed its grants in order to entice more students into graduate programs which would produce more experienced researchers. Some of these changes include: the removal of the award limits that an NSERC grant recipient may accept, increases in professor's grants from which they may pay salaries to grad students as compensation (this allows profs more freedom to choose their own researchers without imposed academic requirement), and increases in grant sizes and/or numher. All in all it seems a very encouraging picture for those wishing to continue into graduate work.

In addition to these were other speakers who reiterated much the same things or examined them in a different light or from the viewpoint of their own expertise. There were also presentations from various McMaster faculty memhers regarding their own research efforts. In summary, the conference was a success in that it presented and examined various aspects of R & D from many different viewpoints and provided the means for intelligent discussion.

Engineering Forum I

Composite Materials at UTIAS

by Howard Sandler
Eng Sci 8T4



Above is the space environment simulation chamber at UTIAS. This simulator is capable of subjecting samples to pressures lower than 10E-8 atmospheres as well as to thermal and mechanical stress.

The Canadian "arm" of the space shuttle Columbia performed flawlessly on its first flight this past month, thanks, in part, to composite materials research at the University of Toronto Institute for Aerospace Studies (UTIAS).

The institute determined the impact criteria for the long sections of the arm joining the shoulder, elbow, and wrist. Each section was composed of a skeleton tube of graphite-epoxy composite. This material is light, has stiffness, yet is quite brittle. In order to absorb shocks, the skeleton was covered with a honeycombed layer of Nomex. Finally, each section was covered with a skin of impact resistant Kevlar (a composite material often used in bullet-proof vests).

But the arm is only one facet of the composite materials research being conducted at UTIAS. "We are the largest composites research group in Canada—bar none," said Prof. R. C. Tennyson of the institute. The composites group at UTIAS receives $100,000 per year in contract research from NASA and the Unites States Air Force, as well as additional funds from the Department of National Defence and some Canadian civilian groups.

Composite materials are usually composed of polymers, such as epoxy, containing reinforcing fibres, like graphite, for strength. Their main advantage, aside from lightness, is that they can be designed relatively easily to have specific physical properties. This can be done, for example, by laminating several layers together with the reinforcing fibres set at specific angles to each other.

One particularly desirable property that can be designed into a composite is a near zero coefficient of thermal expansion. Metal satellites, as they pass in and out of the earth's shadow, expand and contract with the sun's heat. Even a slight distortion due to thermal expansion is enough to throw a critically aimed antenna or laser beam out of alignment. Satellites made of suitably designed composites though, will not distort.

However, "You can't get something for nothing," added Tennyson. In order to have a zero coefficient of thermal expansion, different parts of the composite try to pull in different directions causing tremendous stresses that can fatigue the material. In addition, the polymers in composites are degraded by ultraviolet light as well as proton and electron bombardment in space.

A major thrust of research at the institute then, is directed towards determining the lifetime of composites in the space environment. This is very important, explained Tennyson, because the institute is interested in large structures that must have lifetimes of perhaps 30 years to be economically viable.

To conduct such research, there are four space simulation chambers at UTIAS. A sample placed in a simulator can be subjected to pressures as low as 1E-6 torr (less than 1E-8 atm) for long periods of time. In addition, an electronically controlled system of heating and cooling units subjects the sample to thermal cycling as it would receive in space. A new feature in one simulator is a mechanism that administers mechanical stress to the sample.

In mid 1983, UTIAS will be sending composite samples into space aboard the Long Duration Exposure Facility (LDEF) satellite. LDEF is a large, 12 sided polygon whose surface is covered with "trays". One such tray will hold the samples. After being placed in orbit by the eleventh space shuttle, it will remain in space for about one year. Another shuttle will then retrieve it and the samples will be sent back to UTIAS for analysis.

There are two purposes to the experiment. One is to test composites in space. The other is to verify the findings of the simulator tests and prove that using simulators is a valid experimental method, thus avoiding further expensive space tests.

The institute's research could have terrestrial applications too. Composites could be useful as engine parts and are increasingly being used as aircraft components. In fact, the institute will soon be testing an all-composite aircraft structure in its new crash test facility. The results will be compared to tests now being run on more conventional metal structures.

Prof. Tennyson stressed that it is imperative for the Canadian aerospace industry to develop competence in fabricating large composite structures. He explained that, in the future, aircraft will be designed with large sections to made of composites and that Canadian companies without the expertise to make them will lose out on contracts. He also notes that the composite parts of the shuttle arm, although Canadian designed, were actually fabricated in the U.S. by an American firm.

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Engineering Forum II

IBM 3081: Computer Power

Pictured is the new 3081 Prncessnr Unit. It takes half the size nf the 3033 bnt has more than twice the cnmpnting power.

by Colin Doyle
Eng Sci 8T3

Witb tbe many advances in microprocessors and tbe growth in popularity of word processors and personal computers, it is easy to forget that large system processors are evolving as well. Actually, nothing could be farther from tbe truth; for example, IBM Canada has announced the arrival of their latest generation of processors, the 3081 processor complex. This processor has two models, tbe 3081 model D, wbich was announced in November of 1980, and the 3081 model K, which was just announced last month. These processors are being touted as tbe next step in large scale computing for the 1980's.

IBM is in the forefront at the moment, as the 3081 is the most powerful commercial processor available and it is expected that IBM's competitors will not be able to match it for the next few years. At present there are five 3081 model D's in Canada and no model K's as of yet. The 3081 is not just a modification on past large scale processors such as tbe IBM 3033, wbicb is what tbe University of Toronto uses for its computing. Indeed, tbe 3081 bas great improvements in operating capacity and speed over tbe 3033 processor, but tbat can he considered the least of the cbanges from previous processors. Unlike other processors sucb as the 3033, tbe 3081 is a **dyadic** processor, consisting of two integrated central processors (CPU's) tbat share tbe same central storage and all cbannels, and run under the control of a single overseer program. This advance is augmented by a corresponding evolution in the physical structure of the processor itself; the **Thermal Conduction Mndule** (TCM). A full size 3081 is made up of 27 TCM's. This modular design greatly reduces the numher of wires and connections inside the processor and allows the largest density of circuits ever acheived in a commercial processor.

The basis of tbe new 3081 processor, the Thermal Conduction Module or TCM, is a helium gas filled assemhly that can house over 45,000 circuits. The TCM is roughly 12.5 centimeters square by 5 centimeters thick, and each TCM is tbe logic circuitry equivalent of a S/370 148 CPU, whicb is wbat used to bandle the HSJS and GPJS here at U. of T. until recently.

There are two types of TCM's, logic and storage. A logic function TCM houses 100 silicon chips mounted directly on a ceramic substrate while a storage function TCM bouses 118 silicon chips. The ceramic substrate consists of 33 ceramic layers each 'personalized' according to wbat function the layer will perform. This consists of punching thousands of holes in each sbeet, screening out interconnections with a molybdenum paste onto tbe sheet and into the boles wbich connect one layer with another. Tben the layers are stacked, laminated and tbe whole structure sintered to give it a tile-like bardness witb superior electrical cbaracteristics. Additional metals are deposited to form contact surfaces for chip placement, pin attachment, and modification wires. The substrate seats 100 or 118 silicon chips, whicb are either higb density advanced bipolar logic chips or higb density bipolar storage arrays.

Advanced TCM's Increase Performance

Due to tbe superior heat dissipation of the TCM's, logic and array chips can be intermixed on the same TCM. The logic cbips bave a cycle time of one to two nanoseconds and are produced from a master slice and customized with electron heam techniques. On top of each chip is a spring loaded anodized aluminum piston which conducts heat from the chip to a sealed upper chamber through wbicb chilled water is flowing. The chips, substrate and pistons are hermetically sealed in a cbamber filled with helium, wbich aids in dissipating the heat and reduces the cbances of outside contamination.

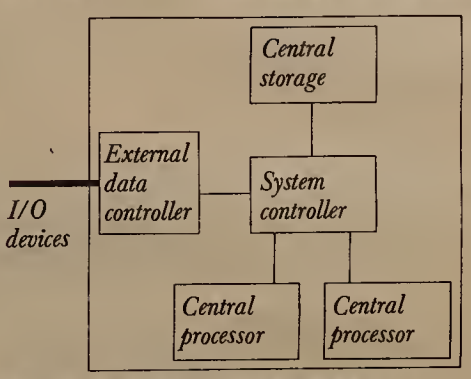
These modules greatly increase performance by increasing circuit density and reducing tbe distances signals must travel. As well, reliability is improved by the enormous reduction in the number of wires required to connect individual cbips and modules, the improved heat dissipation, and tbe increased resistance to physical damage or cbemical contamination.

The modules in turn, plug into hoards witb six or nine positions, that bave a structure similar to the ceramic substrate of tbe TCM. The hoards consist of 20 layers wbicb perform signal transmission and power distribution functions. A new connector design whicb bas the board pins adjusting to tbe module pins allows a repeatable low resistance contact to be made with all 1800 pins of the TCM. Witb tbe use of TCM's and tbe plug in boards, only six percent of all connections in tbe 3081 are made by cables or wires. Eacb TCM eliminates about 6000 connections tbat would be made between logic cards in a S/370 CPU. The connection boards also eliminate several bundred to several tbousand wires or cables that are found in system 370 CPU's.

All tbese advances in solid state circuitry and packaging allow more than three quarters of a million logic circuits to be contained in approximately four cubic feet. The 3081 bas a machine cycle time of 26 nanoseconds, wbicb is over twice as fast as a 3033, wbicb has a 57 nanosecond cycle time. The processor comes witb sixteen channels which can be expanded to twentyfour channels. The channels are bandled hy a data controller inside tbe 3081 and bave direct access to the processor's central storage. In fact, the 3081 is not simply a CPU, but is a much more complex device, using a multiple bus organization. There are tbe two intergated central processors, eacb roughly equivalent to a 3033 without cbannels, the data controller, central storage, and overseeing these four subunits is tbe systems controller.

The systems controller is practically a large scale processor in its own right, as it is completely microcoded; that is to say, all instructions inside the 3081 are under full microcode control. The 3081 contains over 100 times tbe microcode that is in a 3033 processor. Tbe microcoding is so extensive in the 3081 that tbe control store containing the microcode is pageable; it operates much the same as IBM's operating system MVS,Multiple Virtual Storage, which is used in large timesbaring systems. This removes capacity constraints from the microcode, and allows a mucb greater flexibility with instructions.

Each central processor has access to central storage and all the channels, and as well it bas a bigh speed storage buffer to reduce effective central storage access time. This buffer is transparent to programs and is eitber 32 kilobytes in size for the model D or 64 kilobytes in size for the model K. The central processors translate addresses using a Dynamic Address Translation Facility (DAT), whicb bas its own buffer tbat holds up to 128 addresses. This greatly reduces tbe time for virtual address translating. Also, if one central processor sbould fail, the second can take over for it, tbus allowing the deferring of maintenance to a more suitable time.



Block diagram showing the internal nrganization of the new processnr. Note the multibns structure.

The 3081 complex can operate in two modes, standard S/370 mode, such as the 3033 uses, which only contains 24 hit addresses, or in **Extended Architecture**(S/370-XA) mode. In the latter mode tbe processor has a bimodal addressing capability; it intermixes the storage and execution of programs tbat use either 24 or 31 bit addresses. This new mode of operation gives a real and virtual storage capability of up to two gigahytes, and increases the size of the S/370 instruction set.

Central storage can be 16, 24, or 32 megabytes and is fully accessable by both central processors, tbe data controller and tbe system controller; this almost twice as large as tbe central storage on 3033's. Eacb channel in tbe 3081 processor can have up to 256 subcbannels, allowing over 4000 devices to be connected to the processor complex. Eacb cbannel has a maximum data transfer rate of three megahytes per second. Since tbe cbannel controller is fully microcode controlled, it allows a queuing order to be determined for the I/O devices attacbed. It even allows central processor access to I/O devices to be queued in the channels, thus saving central processor cycles.

3081 vs 3033

Servicing and reliability of tbe 3081 are also much better than the 3033. It is expected tbat it will take only 24 bours to install a 3081, which is far less than what is needed for a 3033. A feature of tbe complete microcode control is tbat voltages and timing signals inside the 3081 can be adjusted from a remote console without touching the actual processor. Detection of bit errors (botb double and single) as well as the correction of single bit errors is standard on the 3081. Both the 3081 and the 3033 automatically record tbe status of various condition flags and registers in an error log when a malfunction occurs in tbe processor; however, the 3081 goes one step furtber and automatically runs diagnostics on itself. If the 3081 determines tbat it is a bardware error it locates the faulty TCM and sends a message out to a remote console or printer, informing tbe operator of the problem and giving tbe part number of tbe faulty part. Replacement of a TCM itself is quick and simple, minimizing downtime.

Most of the past few paragraphs may bave little meaning to many readers, so we sball compare the 3081 witb the 3033 used to bandle tbe computing at U. of T. The 3081 bas two to three times tbe computing power of our 3033. The 3081 is sligbtly larger than balf the size of our 3033, and only requires one third the power needed to run the 3033 and three tenths the power required to cool a 3033. If our 3033 was upgraded to the ability of a 3081 by adding on extra storage and an attached processor, it would take up three times the room of a 3081 and use five times the power in running and six times the power in cooling that a 3081 would. It is estimated that the savings in Hydro alone in a single year would be 85,000 dollars if you bad a 3081 instead of a 3033 with attached processor. At this time tbere are five model D's in canada, witb the first model K expected late in 1982. However, with a pricetag of 5.6 million dollars, it will be a very long time before one shows up on the U. of T. campus.

Special thanks goes to Janet Vereshack and Peter Jakab of IBM for their time and assistance, as well as many others in IBM.

Eng. Soc. News

Engineering Alumni Athlete

Photo by Bea Poblete

Jim Horn presenting Jack Silva with his award. This award is presented hi-monthly to an Engineering Undergraduate for their high involvement and outstanding performance in intramural athletics. Nomination forms are availahle from Ella, the Engineering Society secretary in the Eng. Soc. offices.

Jim Horn is a graduate of Chemical Engineering 4T9 and is presently Vice-President of the Engineering Alumni Council.

Jack Silva (Chem 8T2) is the player-coach of this year's senior engineering soccer team, which made it to the finals where they lost to Erindale.

Design Competition Deadline Here

hy Brett Calder
OEDC Comm. Chairman

The Ontario Engineering Design competition is well under way to hecoming the year's higgest event at the University of Toronto. This article will summarize the applications that have heen coming in from all across Ontario, with University of Toronto students dominating the applications to date. The competition still has room in the Corporate Design Category and hoth Editorial and Explanatory Communication divisions. This year, the University of Toronto has the opportunity to move in and make the OEDC a truly U of T dominated event. There is still time to make your dehut tc the puhlic and the profession. You may win valuahle prizes, hut more importantly you will gain the exposure instrumental to every engineering student's professional development.

Corporate Design

The big news is the return of the talented comhination of Lawrence Kwan and Albert Li, fourth year Mech students who have heen placed first in this category since the inception of the competition in 1980 at Queen's University. Both Alhert and Lawrence express concern over finding someone to maintain the University of Toronto's winning tradition in the Corporate Design category after they graduate this year. We can all he very proud of their efforts and success so far, and we wish them the hest in this year's competition as they tackle Massey-Ferguson's suggested project, a "variahle speed reversihle header drive for comhines".

Students from all disciplines can find a challenge among the wide variety of engineering problems collected from a hroad cross section of Canadian industry. Project suggestions come from large corporations such as Bell, Ontario Hydro, Massey-Ferguson, Alcan, Inco, Stelco, and Procter & Gamhle, as well as smaller enterprises such as Mini Peripherals Inc. Excellent project suggestions from very worthy non-profit organizations such as the Ontario Crippled Children's Centre and the CNIB, provide superlative opportunity to gain experience in engineering design.

Communications

Thesis students take note:

Both the Explanatory and Editorial Communications categories have room for more entries. The seminar format offers the competitors an excellent opportunity to express their ideas and interests while developing presentation abilities and skills. The scope of the categories is houndless, comhining competitiveness with imagination and determination. This is the engineers' chance to show our stereotype to he grossly incorrect. Universities can and do produce literate and articulate engineers who are capable of expressing their opinions, ideas and policies to a non-technically oriented audience. We can prove ourselves to he caring citizens in tune with the issues that affect our profession and our lives. Judges will consist of engineering and science journalists and corporate spokesmen who are on top of the socio-technical issues they have to deal with every day. Professional organizations such as the Association for Professional Engineers of Ontario and the Canadian Council of Professional Engineers will also be active in judging the various entries.

Entrepreneurial Design

This category of the competition has consistently heen the most popular, and at the time of this article, is virtually full. If you still wish to enter this category, you had better be quick and you had hetter he good, because the competition is extremely keen.

Skule Athletics Highlights

hy June Li
Chem Eng 8T2

At the women's swimmeet recently. Skule did an amazing thing: finished first! It was amazing because this is the first time Skule has entered a team of any size. The team of twelve racked up 121 points, 13 points ahead of second place Trinity, which had a team of 32 swimmers. Skule completely dominated the individual standings. Pam Selby was second with 25 points, Angela Facey third with 23 points, Hilary Watson fourth with 22 points, Karen Wright fifth with 20 points and Dale Kerr sixth with 19 points. All who participated placed at least once in the top six.

The men's swimmeet was held the week prior to the women's swimmeet. Skule, unfortunately, was unable to defend the title and lost by three points to Dentistry. In the past, Skule has won just hy sheer numbers. This year, there were only 12 participants, ahout half the numbers on the Dents team, so considering everything, they did very well.

Other Skule playoff teams, although not champions, have also done well. Most exciting was the Senior Engineering soccer team in their finals against Erindale. In the game on Novemher 13, the teams were tied 1-1 after regular time and 1-1 after overtime. The game went to penalty kicks and a 4-4 tie. The game was called because of darkness. A week later, the game was replayed and Engineering lost 2-0. For once, the team has not had "a rehuilding year" and most players are returning next year.

The women's soccer team finished first in their division and made it to the semi-finals were they lost to SMC.

The women's basketball team, which finished third in the regular season, defeated an extremely strong PHE team last week in the semi-finals. The finals will be played this week and the players would like to see the field house filled to capacity with cheering spectators.

The senior men's soccer team defeated Knox (above) only to lose the final to Erindale in a true pressure cooker of a game.

Entrepreneurial Outlines

Below is a listing of project outlines provided by entrants in this year's OEDC in the Entrepreneurial Design class.

U of T

Entrant: Lewis Kaiserseder
Mech III

An Automatic control valve for solar heated pool systems, unique in that it features a no-clogging/jamming design along with continuous drainback, 100% valve action (for improved system efficiency) and a much wider range of applications.

Entrant: Agostino C. Rinella
MMS Eng I

HYPERTRIKE represents the next stage in the evolution of the bicycle as a commuter vehicle. The vehicle's design repositions the rider thereby increasing comfort and reducing drag. Design criteria include versatility, durability, rider protection from unpleasant weather (dust and wind), low purchase and maintenance costs, easy contruction and upkeep, cruising speeds of 30 to 50 Kph.

Entrant: Y. C. Sbiu
Elec Eng III

A Chestpain analyzer for cardiac outpatients. It utilizes a microprocessor, software, tape recorder and skin electrodes to interpret and record any detectable irregularities in the patient's electrocardiac activities *without seeing a doctor*. The design features portability, a warning system and economic feasibility since only a small portion of chestpain patients have cardiac abnormalities.

Entrant: Collon Lee
Elec Eng III

A 110v to 220v transformerless AC converter which would make the many appliances brought into Canada from European and Far Eastern immigrants useful in their Canadian homes. Current converters make use of power transformers and are not always commercially available. This design will be for the use of households and travellers featuring high power capacity, small and lightweight as well as low cost.

Entrant: Bill Unger
Mech Eng IV

Surface topology evaluation using Moire fringe analysis can be applied to the inspection of components of high performance aerospace structures. This design project is embodied by a portable, self-contained device for lab or field work. It should be capable of detecting component "hot spots" of stress field anomonlies associated with surface irregularities.

Entrant: Ross Gillett
Eng Sci I

Electric solid body guitars can be the subject of very innovative design. The uniqueness of the L1 and L2 lies in the body design taking advantage of wood vibration adding a distinct flavour to its sound. Several innovative circuitry modifications also distinguish these guitars from the rest. Designed for a guitarist by a guitarist, the design involves human factors, electronics, acoustics, trussing systems and competitive cost analysis.

From Queen's University

Entrant: Alex Wincb
Eng I

Computer assisted laser micrometers (CALM's) for fast, accurate, practical measuring device for the thickness of thin transparent films. The research has gone through three stages of development, the last stage CALM III measuring the thickness of a moving film, and has patents being applied for in Canada for applications in the plastic extrusion process. (©Alex Wincb, 1981)

Entrants: Tet Hin Yeap,
Thomas Chui,
Patric Ma
Elec Eng IV

A computer music network providing non-broadcast music services to the Home-of-the-Future, using a microprocessor to interface a keyboard instrument with a central data base. Subscribers would have the opportunity to choose from a large music file to suit their preference.

The Misses Purity (above) were prize winning vehicles designed by U of T students years ago. Will U of T again rise to the occasion and produce excellent designs at the OEDC?

From Waterloo

Entrant: Steve Bellingbam
Sys. Des.IV

A radio frequency Syntbesis System for use in a receiver which tunes the 3-30 MHz range. The receiver will approximate continuous tuning and the stability of the synthesizer will be equal to that of a good crystal oscillator. The system is designed to form the basis of a radio transceiver (as well as being adaptable to other uses of the high frequency spectrum) so that it can be marketed to bam operators in Canada and the U.S.

Entrants: Peter Laurich
Terance Ng
Gary Hutchinson
Sys. Des. IV

A Computerized voice recognition system for performing man-machine communication has bad problems in the past overcoming recognition of continuous speecb. The design of this system consists of feature extraction hardware interfaced with a microprocessor for the development and testing of pattern recognition software. Theoretically, pattern matching algorithms have the same potential for success as those for buman auditory systems, stepping closer to the goal of continuous speecb recognition.

From Windsor

Entrants: Fred Gneuchtel,
Rohert Wbent,
Jimmy Daabous,
Bill Vass
Elec Eng III

A portable information management control and computer facility is a move away from the implementation of large and expensive mainframe computer systems. This design is huilt for versatility and durability, packaged in a small suitcase sized carrying case, and is economical as well.

Entrants: John L. Florian
Civil Eng III
Doug Fregin,
Herb Goettmann
Elec III

Liquid crystal display oscilloscopes will eliminate the disadvantages inherent in the large and beavy CRT scopes. LCD technology will be fully expoited in this design to provide a low cost portable design with as many oscilloscope-like features as possible.

From Guelph

Entrants: Jane Corkal
Bio Eng III
Carl Cousins,
Nancy Harris
Agr Eng

A pressure monitoring device for monitoring pressure build-up under an arm or leg cast is needed because of the costly results (muscle paralysis or gangrenous necrosis (death of tissue)) of unnoticed build-ups. There is presently no commercially available device, so consequently the doctor must improvise.

Entrants: Tony Hanusiak
Agr Eng III
Greg Scott,
Clair Frechette
Dave Steckle
Agr Eng IV

Design of a remote detector of silo gas. Interfacing the resulting unit with a ventilation control system will automatically detect, warn and control ventilation of the lethal nitrogen dioxide.

From RMC

Entrants: James Fraser,
Mike Donaghy,
Lawrence Aitken,
Will Groten
Chem IV

Production of Diesel fuel from Eastern Canada's coal reserves economically in a hydrogenating chemical process demonstrating an alternative for meeting Canada's deisel fuel requirements and possibly reducing significantly her dependence on foreign oil.

From Western

Entrant: John Blair Wallace
Chem Eng IV

A hioreactor designed specifically for the anaerohic production of ethanol, a potential fuel if petroleum is in short supply.

Engineering This Month

If you are organizing an event, or know of one, that would be of specific interest to Eng. Soc. members, please drop a short note about it in the Tiny Toike box in the Society offices or contact Ella at 978-2917. It will be listed here free of charge.

Tuesday, December 1
Engineering Society Meeting

The last full meeting of the Engineering Society Council will be held in room GB 202 from 5:00 p.m. Be sure to have your class representative attend or drop by yourself; this is a very important meeting. Due to its importance, please be on time and prepared to discuss the major issue, the Dean's fee proposal (that is, read page 1 so that you know the situation status).

Friday, December 4
Engineering Pub

The *Last Bash Before the Crash* pub will be held in New College's Wetmore Hall from 8:00 p.m. Admission is only $1.00 and a good time is guaranteed (well, almost...thanks Anna). Bring a friend. Be there or T-square (?? Not mine, its DelConte's).

Friday, December 4
OEDC Deadline

The Ontario Engineering Design Competition (OEDC) has extended its deadline to this date as a last chance for those interested but not yet entered to sign up. Although the Entrepreneurial Design category is almost filled up, there are still several vacancies in the Corporate Design division as well as in both the Editorial and the Explanatory Communications sections.

Wednesday, December 9 to Tuesday, December 22
Exams

Everyone's favourite time of year is with us again. The do-or-die finals are here and we, at *the CANNON*, wish you good luck and speedy recovery.

Monday, January 4
First Day of Classes

Time to forget about what you should or should not have done for that pesky exam last term. Start the next term fresh and follow those New Year's resolutions!

Wednesday, January 6 to Saturday, January 9
CCES Conference

The annual Canadian Congress of Engineering Students (CCES) conference will be held in Waterloo this time around. People interested in going as U of T delegates should contact Vince Volpe of the Professional Development Committee.

Friday, January 8
Toike Make-Up

The Toike will follow in the tradition of *The Glob and Male* with another parody. Right now, it appears the satire will be about Newsweek magazine. Bring the material you have been feverishly working on over Christmas. Free beer and food as usual. Come down to the Engineering Stores from 5:00 p.m.

Monday, January 11 to Friday, January 15
Godiva Week

Read *the CANNON* scheduled on January 12 for more details and keep an eye open for the inevitable signs which will appear as if by magic. Many events will occur this week including the Nth Annual Chariot Race, the Godiva Pub, and Engineering Ski Day.

OEDC

The brightest engineers of the future are probably working on their Ontario Engineering Design Competition entries right now.

See the results March 5-6.
Sir Sanford Fleming Building
Faculty of Engineering
University of Toronto
St. George Campus
(Downtown Toronto)

The Engineering Stores

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VISIT JUNIE

Summer Jobs

The summer jobs listed here were accurate at 5:00 p.m. Friday before press. Deadline changes, as well as new job additions, may occur to make these listings inaccurate throughout the month. Please visit the U of T Career Counselling and Placement Centre for accurate, up to date information.

Bell Canada, Ontario Region Employment. Third year Civil, Electrical, and Mechanical engineering students are sought after. Application deadline is December 11, 1981.

Minorex Limited. Third and fourth year Geological engineers for the position of senior geological assistant. Apply on or before December 19.

IAESTE. Work overseas for the summer. See the Summer/Part Time Desk at the CCPC for more information. Suggested application deadline is January 8.

Ontario Hydro. Third year Chemical, Electrical, Engineering Science, and Mechanical engineering students. Deadline for application is January 19.

Communication Engineering Services Limited. Electrical engineering students, second, third or fourth year. Apply on or before January 25.